

Company: Company

Project: IE HECTOR MANUEL VIDES BALLESTEROS (MÓDULO 5)

File: C:\IE REGIDOR\MOD5.rcb

Engineer: Name

9:37:59 a. m. 27/06/2025

SEISMIC DESIGN CODE: COLNSR-10

SEISMIC BASE LEVEL : 1

SEISMIC FORCE RESISTING SYSTEM

System X-Direction: C: Moment Res.Frame

System Y-Direction: C: Moment Res.Frame

Energy dissip capacity: 2: Moderate-DMO

RESPONSE SPECTRUM EARTHQUAKE FORCES COLNSR-10

Elastic Modal Base Shear

Vm = Sam Wm'

Sam = Spectral modal acceleration

Wm' = Effective modal weight

ANALYSIS PARAMETERS

Number of modes to be included ... = 3

	X-direction	Y-direction
	-----	-----
Energy dissipation coefficient, Ro =	5	5

SPECTRAL MODAL ACCELERATION

Sam = 2.5 Aa Fa I [0.4+0.6T/To] For Tm <= To

Sam = 2.5 Aa Fa I For To < Tm <= Tc

Sam = 1.2 Av Fv I/Tm For Tc < Tm < Tl

Sam = 1.2 Av Fv Tl I/Tm² For Tm > Tl

Eff. peak acceleration & veloc., Aa = .15 Av = .15

Region:	10	9	8	7	6	5	4	3	2	1
Aa or Av	0.50	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10	0.05

LOCATION	Aa	Av	Menace
Barranquilla, Cartagena, San Andres, Valledupar	0.10	0.10	Low
Bogota, Medellin	0.15	0.20	Interm
Armenia, Bucaramanga, Cali, Manizalez, Pereira	0.25	0.25	High
Cucuta, Villavicencio	0.35	0.30	High
Quibdo	0.35	0.35	High

Importance coefficient, I = 1.25

GROUP	COEFFICIENT
IV - Essential facilities	1.50
III- Public assistance facilities	1.25
II - Especial occupancy buildings	1.10
I - Normal occupancy buildings	1.00

Site profile type, S = D

TYPE	SOIL PROFILE TYPE	Shear Wave Velocity
A	Hard Rock	> 1500 m/s
B	Rock	1500 - 760 m/s
C	Very Dense Soil & Soft Rock	760 - 360 m/s
D	Stiff Soil Profile	360 - 180 m/s
E	Soft Soil Profile	< 180 m/s
F	Soils requiring site-specific evaluations	

SPECTRAL MODAL ACCELERATION

Sam = 2.5 Aa Fa I [0.4+0.6T/To]

For Tm <= To

Sam = 2.5 Aa Fa I

For To < Tm <= Tc

Sam = 1.2 Av Fv I/Tm

For Tc < Tm < Tl

Sam = 1.2 Av Fv Tl I/Tm²

For Tm > Tl

DESIGN SPECTRAL RESPONSE ACCELERATION PARAMETERS

Short Periods

Long Periods

Effect. peak acceleration & velc.,

Aa = 0.15

Av = 0.15

Site coefficients (Tables below),

Fa = 1.50

Fv = 2.20

Design response parameters,

Aa Fa = 0.23

Av Fv= 0.33

Long-period transition period, Tl sec =

5.28

(2.4 Fv)

Site Coefficient Fa

=====

Site Class	Aa<=0.1	Aa=0.2	Aa=0.3	Aa=0.4	Ss>=0.5
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	a	a	a	a	a

Site Coefficient Fv

=====

Site Class	Av<=0.1	Av=0.2	Av=0.3	Av=0.4	Av>=0.5
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	a	a	a	a	a

a: Site-specific geotechnical investigation required

Reduction in R for Irregularity and Lack of Redundancy:

PLAN IRREGULARITIES

Type	Description	Øp
1aP	Torsional	0.9
1bP	Torsional Extrme	0.8
2P	Reentrant corners	0.9
3P	Diaph. discontin.	0.9
4P	Plane shifting	0.8
5P	Unparallel grid	0.9

ELEVATION IRREGULARITIES

Type	Description	Øa
1aA	Flexible	0.9
1bA	Flexible Extrme	0.8
2A	Mass	0.9
3A	Geometrical	0.9
4A	Plane shifting	0.8
5aA	Weak Story	0.9
5bA	Weak Story Extr	0.8

NOTE: EngSolutions RCB assumes irregular building.

For regular buildings make (Øp . Øa)= 1.0

X - D I R E C T I O N

Y - D I R E C T I O N

Reduct. factor, (Øp.Øa) =

0.8

0.8

Redundancy factor, Ør =

1

1

R = (Øp Øa) Ør Ro

Company: Company

Project: IE HECTOR MANUEL VIDES BALLESTEROS (MÓDULO 5)

Engineer: Name

9:37:59 a. m. 27/06/2025

S T A T I C E Q U I V A L E N T B A S E S H E A R

Building Weight, W, (ton) = 373.2

Peak Acceleration Coeffi., Aa Fa = .23
 Peak Velocity Coefficient, Av Fv = .33
 Importance factor, I = 1.25
 Site class, S = D
 Coeff. for upper limit period, Cu = 1.354

	X-direction	Y-direction
Computed Period	= 0.205	0.166
Ta = Ct (H)^x	= 0.047 H^0.9	0.047 H^0.9
	= 0.128	0.128
Tmax = Cu Ta	= 0.174	0.174
Fundamental Period	= 0.174	0.166
Energ-Disspst coeff, R	= 4	4
1.2 Av Fv I / T	= 2.851	2.982
2.5 Aa Fa I	= .719	.719
Sa	= .719	.719
Base Shear, Vo	= 268.24	268.24
Static Shear, .9Vo (ton)	= 241.42	241.42

S P E C T R A L A C C E L E R A T I O N

MODE No	PERIOD (sec)	Sa (g)
1	.205	.719
2	.166	.719
3	.089	.555

M O D A L B A S E S H E A R

MODE No	X - D I R E C T I O N Sax (g)	W'x (ton)	Vx (ton)	Y - D I R E C T I O N Say (g)	W'y (ton)	Vy (ton)
1	.719	372.79	268.04	.719	0	0
2	.719	0	0	.719	370.31	266.25
3	.555	.41	.23	.555	.36	.2

ELASTIC Ve (combined): 268.04 266.25
 STATIC(IREG) 0.9Sa(T1)W 241.42 241.42

Design Base Shear: 268.04 266.25

Total Building Weight, W = 373.2 ton
 Participating Mass, $\Sigma W'/W = 100\%$ in X, 99% in Y
 $W'_{xm} = \{\Sigma W_j \phi_{xjm}\}^2 / \Sigma W_j \phi_{xjm}^2$ $W'_{ym} = \{\Sigma W_j \phi_{yjm}\}^2 / \Sigma W_j \phi_{yjm}^2$
 Combination of Modal Response: SRSS $V = (\Sigma V_i^2)^{1/2}$

A C C I D E N T A L T O R S I O N

	X-direction	Y-direction
Accidental eccentricity as a percentage of building dimension, (%)=	5	5

Company: Company

Project: IE HECTOR MANUEL VIDES BALLESTEROS (MÓDULO 5)

Engineer: Name

9:37:59 a. m. 27/06/2025

A C C I D E N T A L E C C E N T R I C I T Y :

Level -	X - D I R E C T I O N (EQY)			Y - D I R E C T I O N (EQX)		
	$\delta\epsilon^{\circ}$ (m)	A_x -	$\delta\epsilon^x$ (m)	$\delta\epsilon^{\circ}$ (m)	A_x -	$\delta\epsilon^y$ (m)
2	3.28	1.00	3.28	0.58	1.54	0.89

Ax: Amplification factor for accidental eccentricity

EQY: Envelope (1) $E^x = \epsilon^x$ EQX: Envelope (1) $E^y = \epsilon^y$
 (2) $E^x = \epsilon^x + \delta\epsilon^x$ (2) $E^y = \epsilon^y + \delta\epsilon^y$
 (3) $E^x = \epsilon^x - \delta\epsilon^x$ (3) $E^y = \epsilon^y - \delta\epsilon^y$

D E S I G N E C C E N T R I C I T Y : $E = \epsilon + \delta\epsilon$

Level -	X - D I R E C T I O N (EQY)				Y - D I R E C T I O N (EQX)			
	Center Mass CMx	Inherent Eccent. ϵ^x^*	Accident. Eccent. $\delta\epsilon^x$	Design Eccent. E^x	Center Mass CMy	Inherent Eccent. ϵ^y^*	Accident. Eccent. $\delta\epsilon^y$	Design Eccent. E^y
2	32.43	1.50	3.28	4.7878	5.61	-0.66	0.89	-1.555

Note: * Inherent eccentricity: $\epsilon^x = CMx - CRx$ and $\epsilon^y = CMy - CRy$
 All values are in meters

D E S I G N E C C E N T R I C I T Y : $E = \epsilon - \delta\epsilon$

Level -	X - D I R E C T I O N (EQY)				Y - D I R E C T I O N (EQX)			
	Center Mass CMx	Inherent Eccent. ϵ^x^*	Accident. Eccent. $\delta\epsilon^x$	Design Eccent. E^x	Center Mass CMy	Inherent Eccent. ϵ^y^*	Accident. Eccent. $\delta\epsilon^y$	Design Eccent. E^y
2	32.43	1.50	3.28	-1.788	5.61	-0.66	0.89	0.2323

Note: * Inherent eccentricity: $\epsilon^x = CMx - CRx$ and $\epsilon^y = CMy - CRy$
 All values are in meters

Company: Company

Project: IE HECTOR MANUEL VIDES BALLESTEROS (MÓDULO 5)

Engineer: Name

9:37:59 a. m. 27/06/2025

Modal nodal force:

$$F_{im} = V_m \quad W_{im} \quad \phi_{im} / \sum W_j \quad \phi_{jm}$$

$$V_m = S_{am} W'_m$$

$$W'_m = \{ \sum W_j \quad \phi_{jm} \}^2 / \sum W_j \quad \phi_{jm}^2$$

C O M B I N E D M O D A L F O R C E

Floor k ----- 2	Weight W (ton) ----- 373.2	X - DIRECTION		Torsion T=F(E-ε) (ton-m) ----- 238.7
		Force F (ton) ----- 268.0	Shear V (ton) ----- 268.0	

C O M B I N E D M O D A L F O R C E

Floor k ----- 2	Weight W (ton) ----- 373.2	Y - DIRECTION		Torsion T=F(E-ε) (ton-m) ----- 873.8
		Force F (ton) ----- 266.2	Shear V (ton) ----- 266.2	

ACCELERATIONS ON NON-STRUCTURAL ELEMENTS- NSR-10

F L O O R A C C E L E R A T I O N S			
Level ----- 2	hx ----- 3.04	hx/heq ----- 1.33	ax ----- 0.958

Seismic base level = 1
 Height above seismic base, hn = 3.05 m
 Equivalent height, heq = 0.75 hn = 2.29 m
 Ground acceleration, As = Aa Fa I = 0.288
 Spectral acceleration, Sa = 0.718

ax = Sa hx/heq for hx > heq
 ax = As + (Sa -As) hx/heq for hx < heq

Force on structural non-seismic element : Fp = ax Wp / Ro
 Force on nonstructural element : Fp = ax ap Wp / Rp
 > 0.5 Aa I Wp

ap : component amplification factor